ISSN 0228-4111

KEWA

NEWSLETTER OF THE LONDON CHAPTER, ONTARIO ARCHAEOLOGICAL SOCIETY

LONDON CHAPTER OAS

c/o Museum of Ontario Archaeology
1600 Attawandaron Road, London, ON N6G 3M6

Dec. 2012 12-8

The next meeting of the London Chapter will be held on Thursday November 14th 2013. The speaker will be **Dr. Dana Millson**, who will speak about her doctoral work on British Neolithic and Early Bronze Age pottery carried out at Durham University, UK. Her talk is entitled: ***Exploring Regional Identities in Ceramic Remains: An Analysis of Cultural Interaction on the Anglo-Scottish Border at the time of Stonehenge.***

❊❊❊❊❊❊❊❊❊❊❊

December's meeting will be the chapter's **ANNUAL CHRISTMAS PARTY** to be held at the museum on December 12, 2013. The Chapter will provide some snacks and soft drinks but feel free to bring other food contributions and drinks!

❊❊❊❊❊❊❊❊❊❊❊

The January 9th 2014 speaker will be **Dr. Patty Wells**, a post-doctoral fellow at Western. sHE will speak on her research on pre-contact Dorset sites in Newfoundland.

Speaker's Night is held the 2nd Thursday of each month (January to April and September to December) at the Museum of Ontario Archaeology, 1600 Attawandaron Road, near the corner of Wonderland & Fanshawe Park Road, in the northwest part of the city. The meeting starts at 8:00 pm. Doors open at 7:30 PM and as usual there will be free juice and cookies!

Chapter Executive

President
Nancy Van Sas
nancy.vansas@gmail.com

Vice-President
Darcy Fallon
32 Pleasant Ave., Delaware ON N0L 1E0

Treasurer
Christopher Ellis
cjellis@uwo.ca

Editors
Christopher Ellis (519-858-9852)
cjellis@uwo.ca
Christine Dodd (519-434-8853)
drpoulton@rogers.com
Christopher Watts
christopher.watts@utoronto.ca

Directors
Darryl Dan darryl.dann@sympatico.ca
Christopher Watts

ANNUAL RATES

Student	$15.00
Individual	$18.00
Institutional	$21.00
Subscriber	$20.00

Programming Projectile Point Typologies

by Tom Arnold

The purpose of this paper is to describe the development and transformation of a traditional paper based projectile point typology to a digital format and to document the pitfalls and insights that this exercise revealed. Since the early 1990s I have been interested in creating programs specifically geared towards archaeology. I was influenced by articles written by Latta (1985), Reid (1985), and Keron (1986), to name but a few, and more recently by Mesoudi and O'Brien (2008a and 2008b) who have used computer simulation games to test cultural transmission of projectile point technology.

The cumulation of my early 1990 interest was a program I gave the unimaginative name of 'POINTY', which was a projectile point comparison program written in Atari Basic. Why Atari Basic well, yes I admit it, I had an 8-bit and then a 16-bit Atari computers.

The programme included data taken from the Kewa Projectile Point sheets. You entered measured variables from a point and the program compared it to this dataset. The program drew crude outlines of your point and the point closest to it in the dataset. The problem I had then is that the projectile point sheets give a limited number of measured trait ranges (e.g., maximum and minimum lengths) along with some mean values, but very little else to statistically compare point types (see discussion below for details on how the comparison in performed in the programme). They seldom mention how many points were sampled to get the ranges. In addition, in order to even draw a crudely accurate representation other variables had to be derived from the existing measurements and non-metric variable ranges had to be coded (e.g., some points have concave, convex or straight lateral blade edges or some points can be classified as side-notched or expanding stemmed). The required the creation of additional variables to enable even a crude outline drawing and the development of some way to compare points.

This interest in programming was shelved when I returned to school to start my Doctorate. Fortunately, I had printed the code every time I corrected a bug in it. For some bizarre reason I dragged this file to the West Coast and back with me, and still have it and used it as the basis of my current programme.

After completion of my doctorate I took up programming again but had to start from the beginning. A lot had changed in the years since I started and finished my studies, I switched to a Windows computer and programming had shifted to object oriented approach. Luckily Microsoft provided a free version of object oriented programming Visual Basic Express (VB). Microsoft seems to provide an updated version every 2 to 3 years. I am currently using VB 2010 Express and the most recent version is VB 2012 is out for Windows 8.

Since returning to programming I became aware that I was not the only researcher who is interested transforming traditional typologies to the computer. For example, Prindle (2001)

developed a MSDOS based programme for points for New England (http://www.nativetech.org/stone/pointprogram/index.php). Schlader et al. (2004) and Lohse et al. (2005), both of the Idaho State University, Informatics Research Institute, have been investigating artifact classification based on computerized agents (Artificial Intelligence). Other regional typology programmes may also exist that I am not aware of. This is not the place to go into detail of these various approaches to programming typologies.

Once I had become acquainted with in VB programming I was able to start the process of reproducing my initial program in an object oriented environment. First, VB creates a separate data file from information that you enter into a database and then attaches it the VB program. Visual Basic will accept Microsoft Access but there also are free versions of Microsoft SQL Server 2008 or Microsoft SQL Server Express 3.5 that also work. I first needed to create the basic database of the Southern Ontario Projectile Points, thus was born the even less imaginative named 'Projectile Point Database'. This task involved taking all the information (both numerical and text) from the KEWA point sheets and transcribing them into a database. After this was complete I could then begin coding the VB program to display this data and compare projectile points.

THE PROGRAM

Introduction

This section provides and quick overview of how the programme its layout and what it does. The various tabs should be straight forward for most people with even a rudimentary understanding of projectile point typologies.

When the program is starts your first choice is to decide which of the broad classes you wish to view (Figure 1). The 'Projectile Point Database programme initially categorizes point typology of Southern Ontario into four broad forms: lanceolate (includes pentagonal forms), notched (both side and corner), stemmed and triangular. For corner or side notched one additional form appears asking you whether you wish to compare side or corner notched points. Once you have made this decision you are presented with the data ranges for each type for that form of point Figure 2. In addition, an outline drawing of the point style (admitted still a crude one) based on the mid-range values for each variable appears in the lower left hand corner of the window. Three buttons separate the lower left hand pane from a blank pane to the right. The three buttons are 'Close', which closes the point form window; 'Random:, which will be explained below; and 'Update', which will update the drawing to the left if you change any of the range values for that point type.

Each point form window should be self-explanatory. Each has six tabs for each point type. The first (the default tab) gives you the upper and lower limits of each measured variable as well as which discrete variables define each point type. Remaining tabs describes or defines the measured variables (Measurements Defined), the text description of the each point type from the

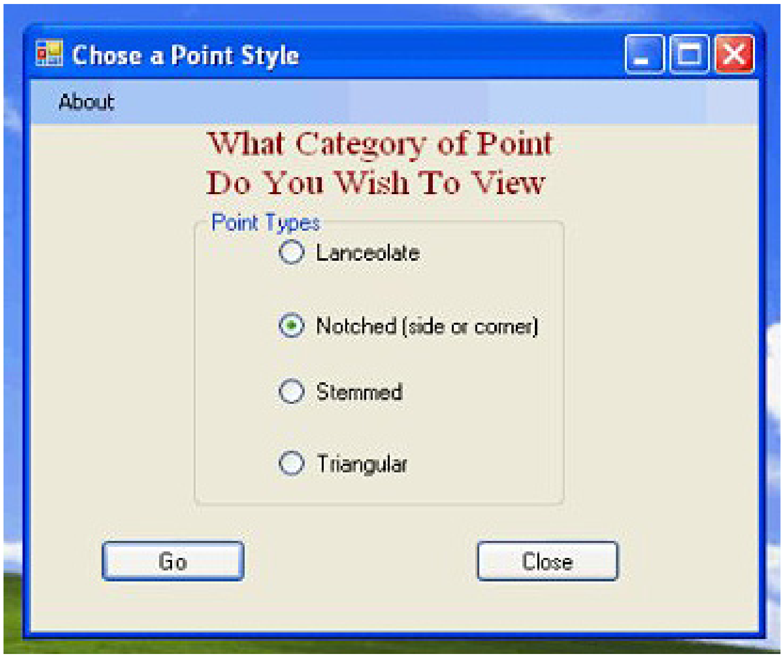

Figure 1: Initial Point Category Screen.

reference articles (Description), provide mid-range and random values, a manipulate tab and finally a comparison tab. Of these tabs only the 'Mid-Random and Random Values', 'Manipulate' and the 'Compare' tab require more detailed explanation.

Mid-Range and Random Tab

This tab is split in two (Figure 3). On on the left is the mid-range values of the projectile point displayed in the bottom left hand corner of the programme window. To the right is a set of blank spaces for random number. When you press the 'Random' button in the bottom centre of the window a random set of values is generated for each variable based on the ranges of the point type currently displayed. Than an outline drawing based on these random values is drawn in the lower right pane of the window. This features displays different possible variations of the current type with results sometime producing unusual configurations that may not be possible or that look like other point types.

Manipulate Tab

Unlike the Random Tab this tab allows you to control the variables used to draw the point in the lower right hand corner (Figure 4). You are restricted to the upper and lower ranges of the point type displayed unless you check the override box.

Compare Tab

This tab (Figure 5) allows you to compare an individual point against the types in that point form (i.e., other Lanceolate Points). First, you enter the measured and non-metric variables on the left and click the draw button. An outline drawing of the point appears in the middle box. Next you click the compare button. The programme compares the point you just entered with the points in the database and gives you the three closest possibilities. A percentage is also given. This tells you how close your point is to the mid-range values of all the measured variables of that particular point (see discussion below for more details on the comparison results).

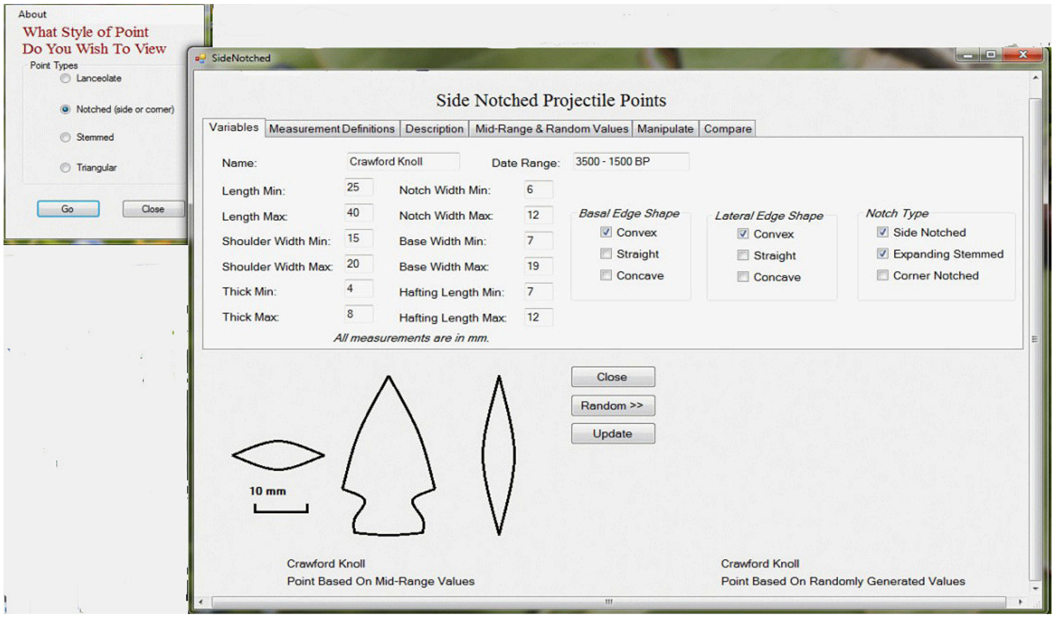

Figure 2: Projectile Point Data Screen.

DISCUSSION

A programme dealing with projectile point types naturally must lead to a discussion on types and typology. What follows is by no means a thorough or detailed review or discussion of typological theory but merely a few brief points that came to mind while creating and using this programme.

As we are all taught in undergraduate courses, archaeology borrowed the concept of typology from geology. The type fossil along with the basic principals of stratigraphy (lower strata are older than higher strata) were used for relative dating of stratigraphic columns, prior to the advent of radiometric dating techniques (e.g., C^{14} dating) (Bray and Trump 1975:240).

In archaeology, the introduction of the concept of types brought order to the chaos of data (artifacts). Types by their nature attempt to enforce boundaries or reduce the continuum of variation among artifacts (see Charlin and Gonzalez 2012:226-227, for a summary discussion). Types are therefore a form of cluster analysis, the original definers of the types were looking for patterns in the size and shape of a group of points. This clustering reduces the variability observed in a population of artifact and sets barriers of size and shape that define the types. The opening tab asking you to choose a category of point (Figure 1) is a prime example of this enforced reduction in variation.

Archaeological types are traditionally based on form and manufacturing techniques and provide a means of categorizing and cataloguing. Although, criticized as being subjective despite

attempts over the last 30 or 40 years to create objective classes using statistical techniques, it still remains a basis for archaeological interpretations, explanations and dating, at least at an initial level in many studies. In cultural resource management work types are vital to dating sites and helping to quickly decide whether a site requires additional work. Trigger (1989:382) sees typologies as providing low level generalizations about the past. When archaeological types are radiometrically dated they may be used to date finds and sites from neighbouring regions without the need to obtain further radiometric dates. Although, useful as an initial estimate of site age the extended use of this form of regional dating transference can obscure archaeological explanations such as diffusion, migration etc. by inhibiting the obtaining of new radiocarbon dating assays.

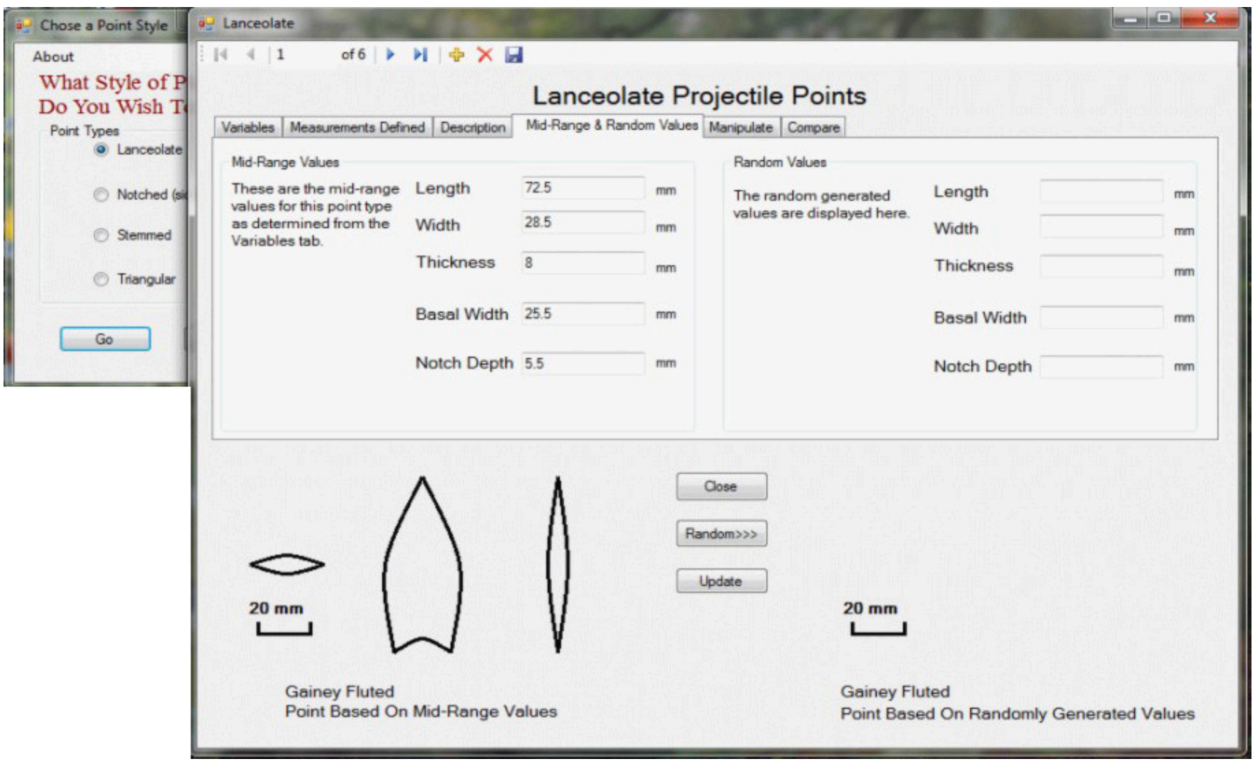

Figure 3: Mid-Range & Random Tab.

Types and typology, therefore, reflect the philosophical world view of ‘Essentialism’, or the idea that the “world is divided into real, discontinuous and immutable kinds (Wikepedia 2013). Whether or not you accept the world view of ‘Essentialism’, there has been debate as to how ‘real’ types are. It has generally been accepted that types may mean more or have more importance to the archaeologist than they did to the people who manufactured the artifacts (Trigger 1989:382-383). Yet, archaeologists its seems find it difficult to accept the idea that all the different forms noted had no meaning, either in a functional or stylistic sense, to the people who made and used them, especially those types that appear to be contemporaneous. It is questions surrounding why these difference occur in the archaeological record that can lead to

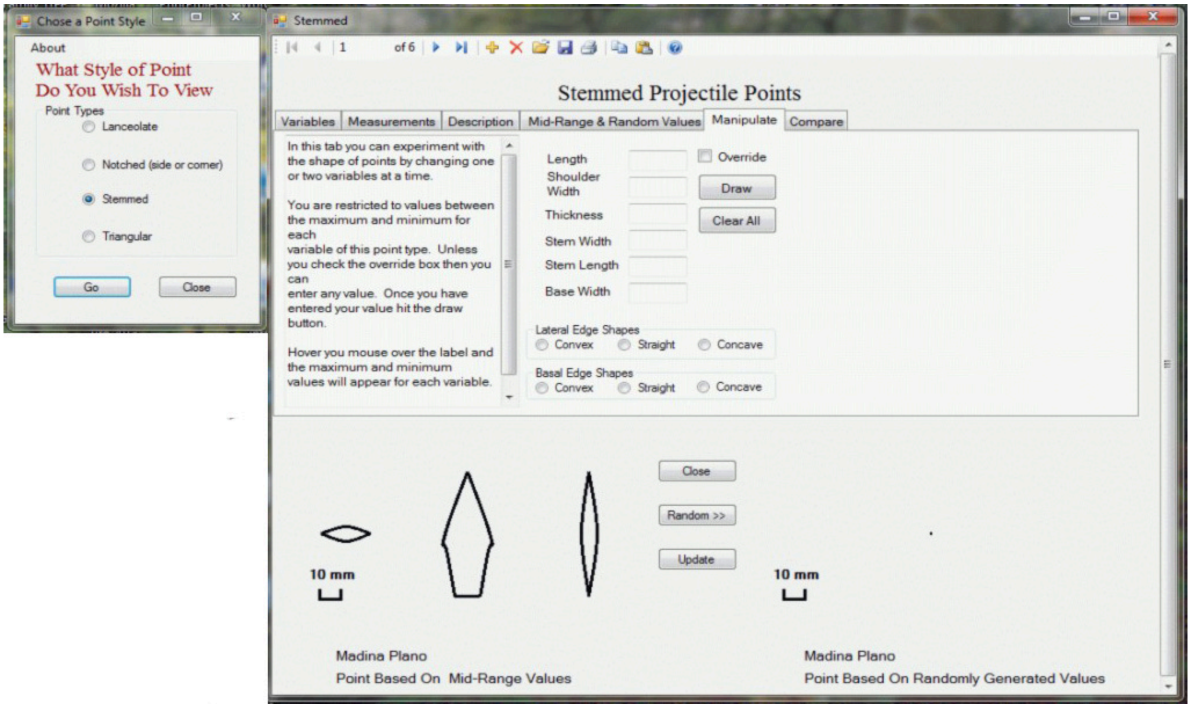

Figure 4: Manipulate Tab.

higher levels of generalizations, explanations, interpretations and inferences about the archaeological record that go far beyond the lowly artifact type.

Traditionally, projectile point typologies use orthogonal measurements (length, width, etc. taken at right angles to each other) to describe types. Such measurements, however, do not accurately portray the true form of an individual artifact or types (Shott and Trail 2012:14). Thus, discrete traits (e.g., present or absent of basal notching) have been used to provide additional descriptive and identifying features. Also, written descriptions, for example ‘Projectile Point Type A as a convex lateral blade edge shape’ have also been used to help better visualize the form of types. In most cases, these ‘discrete and descriptive traits’ may be present in some percentage in one or more types making their use as type identifier difficult because they overlap with other type (see Figure 6 for an example). Probably the most useful traditional way used to get at point type shape or form is the use of ratios. Ratios are derived from the orthogonal measurements (length:width, length to width). They relate one measurement to another and thus describe the form of that point or type, long and wide as opposed to short and thin.

In the comparison portion of the programme I used ratios for two reasons. These were the same reasons I used on my early 1990s. First, to save on programming. Taking single measurements and comparing them to the range of all the point types seemed very cumbersome and in the end I still had to deal with assessing all those comparison and determining which type best fits the comparison point. Second, I felt ratios better reflect the form of a type.

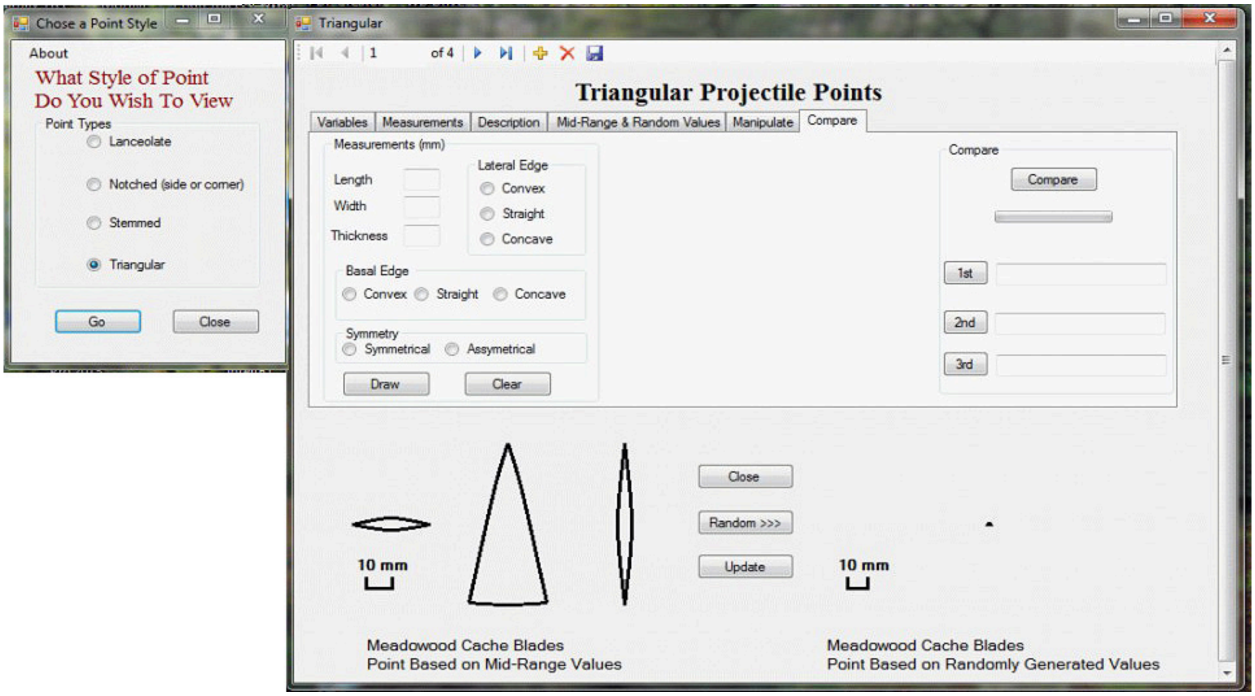

Figure 5: Compare Tab.

My use of ratios differed from the traditional two measurement ratio by incorporating all the measurements into a single ratio that I named the 'score'. This provided each type with an upper and lower 'score' calculated from the upper and lower ranges of the type measurements. As noted above, the mid-point is then calculated and the 'score' from an unknown point is then compared to this mid-point 'score' for each type. A percentage difference from the mid-point is then calculated (mid-point = 100% and upper and lower score = 0%). The point type with the least difference from the mid-point is considered to be the most likely point type for the unknown point. The three highest percentage types are displayed.

My reasoning behind this approach is an extension of the ratio assumption that a pair of artifact measurements has a relationship to each other. By using all the measurements to create a ratio I assume that all measurements of complete artifacts are in some way related, or else the artifact would not exist. The score range for each type is also different from the range of other types. This should be no great revelation to anyone. These 'score' numbers are extremely small fractions are hard to interpret by the human brain (I know I tried) unlike the simpler traditional two measurement ratios. Computers, however, can make the calculations and comparisons quickly.

Therefore, a ratio that incorporates all the measurements should best reflect the shape or form of the artifact or type. It should be noted, that the measurements do not have to be orthogonal to have a relationship. Whether or not these relationships are statistically significant or that they are

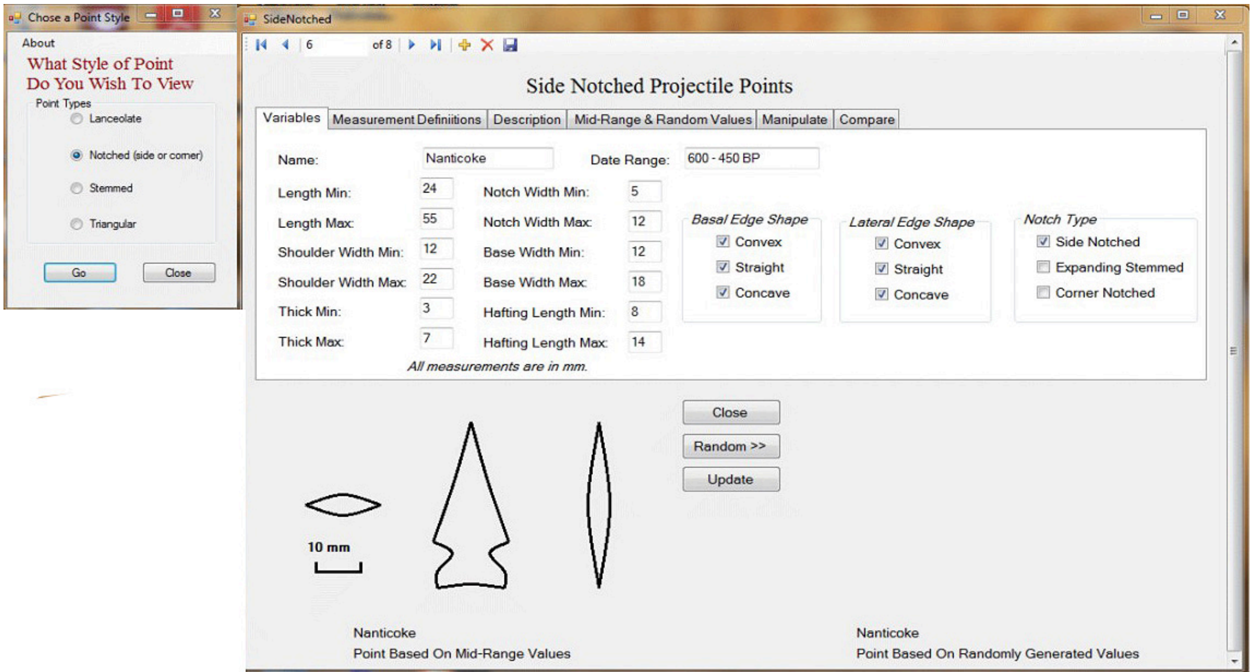

Figure 6: Nanticoke Side Notched Point Showing the Range of Variation on Non-metric Variables.

statistically significantly different from those of other types is also not necessarily important, but would be useful.

Although the assumptions surrounding the ‘score’ have not been proven, using the programme to compare unknown points has produced results that show three different possibilities with different percentages. If the approach was not working I would have expected more instances of very similar or identical percentage differences. So it would appear that the different types do have different ratio ‘score’ ranges. The comparison has been tested on published identified points and has produces results that agree to a certain degree with the published identification. The published point type is not always the one with the highest % but maybe second or third. Also, occasionally no suggested point types are displayed, which suggests that either the point is highly reworked is of a point type that is not yet been identified or at least entered into the databse. Although somewhat circumstantial, this does suggest there is some merit to this approach and assumption.

WHAT IS NEXT?

I think with the increase sophistication of 2D and 3D scanning it will become easier to scan in points and use their form to compare them to others (for example, see Buchanan and Collard 2010; Drydan 2001). In some ways my program and those of Prindle (2001), Schlader et al. (2004) and Lohse et al. (2005) bridge the gap between the traditional use of typologies and what

may come in the future. Finally, I am currently planning on re-creating the program in Java to make it more accessible on other platforms.

I must admit that in the back of my mind when I first conceived my first point typology program in the early 1990s was this idea of a hand held device, *a la* a Star Trek, that one could use to scan in a point in the field and confirm immediately its type. With today's smartphone technology the hardware is here, or nearly so, all that is needed is the application to make this possible. The software for identifying form is also here (see Rolf 2008; Rolf and Slice 1990). What is needed is the database of typology point forms and the programming to connect these three into a useful field application.

Acknowledgements: I would like to acknowledge the help of Barb Johnson and Bethany Findlay who have both used and provided feedback on the programme, including pointing out some of the bugs.

REFERENCES CITED

Bray, Warrick and David Trump
1975 *The Penguin Dictionary of Archaeology*. Penguin Books, Hammondsworth, England, reprinted 1975.

Buchanan, Briggs and Mark Collard
2010 A Geometric Morphometrics-Based Assessment of Blade Shape Differences Among Paleoindian Projectile Point Types from Western North America. *Journal of Archaeological Science* 37: 350-359.

Drydan, Ian L.
2001 Statistical shape analysis in Archaeology. This article is a summary of a presentation at the workshop 'Spatial Statistics in Archaeology' held at the University of Chieti, Italy, July, 2000. http://www.faculty.biol.ttu.edu/strauss/morphometrics/readings/dryden2001.pdf accessed Sept 19, 2013

Keron, James
1986 CSPMAP: A Surface Distribution Plot Program Or The Lazy Archaeologist: Why Draw up a Map When a Machine Will do it for You? *Kewa* 86(1):3-10.

Kenyon, Ian
1985 The Walls That Wouldn't Be Straight. *Kewa* 85(1):11-12.

Latta, M.A.
1985 Two Easy Pieces for the Microcomputer. *Kewa* 85(1):2-5.

Lohse, E.S, C. Schou, R. Schlader and D. Sammons
2005 Detailed Automated Comparisons of Distinctive Projectile Point Type Sequences of Northern Intermountain West. Paper presented at the 63rd Plains Conference, Edmonton, Alberta.
http://iri.isu.edu/AIRC%20Research%20Documents/Points%20Docs%20documents/IRI%20website/Plains%2005rev.ppt, access July 27th, 2010.

Mesoudi, Alex and Michael J. O'Brien
2008a Cultural Transmission of Great Basin Projectile-Point Technology I: An Agent-Based Computer Simulation. *American Antiquity* 73:3-28.
2008b Cultural Transmission of Great Basin Projectile-Point Technology II: An Agent-Based Computer Simulation. *American Antiquity* 73:627-644.

Prindle, Tara
2001 Point: Projectile Point Classification Program.
http://www.nativetech.org/stone/pointprogram/index.php, accessed July 27th 2010.

Reid, Peter
1985 You, Your Microcomputer, and Basic Decay. *Kewa* 85(1):5-10.

Rolf, James F and Dennis E. Slice
1990 Extensions of Proscrustes Method for Optimal Superimposition of Landmarks. *Systematic Zoology* 39:40-59.

Rolf, James F.
2008 *TPSDig version 2.12.* Department of Ecology and Evolution. State University, Stoney Brook, New York.

Schlader, R, E.S. Lohse, C. Schou and A. Strickland
2004 SIGGI-AACS, a Prototype for Archaeological Artifact Classification using Computerized Agents, access July 26, 2010, http://iri.isu.edu/AACSDocuments/SchladerCAA2004.doc

Shott, Michael J and Brian W. Trail
2012 New Developments in Lithic Analysis: Laser Scanning and Digitial Modeling. *The SAA Archaeological Record* 12(3):12- 18.

Trigger, Bruce G.
1989 *A Hstory of Archaeological Thought*. Cambridge University Press, Cambridge.

Wikepedia
2013 Typology (archaeology), http://en.wikipedia.org/wiki/Typology_(archaeology), accessed August 26, 2013.